REMARKS/ARGUMENTS

In the Office action dated May 17, 2005, claims 1, 4 – 6, 8, 12 – 17, 19, and 20 were rejected. Applicants hereby request reconsideration of the application in view of the below-provided remarks.

Claim 1

Claim 1 was rejected under 35 U.S.C. 103(a) as being unpatentable over Wetherell (U.S. Pat. No. 4,723,315) in view of Tsunetsugu et al. (H. Tsunetsugu et al., "A Packaging Technique for an Optical 90°-Hybrid Balanced Receiver Using a Planar Lightwave Circuit", IEEE Transactions on Component, Packaging, and Manufacturing Technology – Part B, Vol. 19, No. 3, August 1996, hereinafter Tsunetsugu). The Office action states that "[t]he difference between Wetherell and the claimed invention is that Wetherell does not teach a planar PBS" (polarizing beam splitter). The Office action cites Tsunetsugu as teaching a planar PBS and concludes that it would have been obvious to modify the teachings of Wetherell with the teachings of Tsunetsugu to arrive at the claimed invention.

Claim 1 recites:

> "a planar waveguide optical coupler for combining an input signal and a local oscillator signal into a combined optical signal, said planar waveguide optical coupler having a first output for outputting a first beam of said combined optical signal;
>
> a polarization rotator attached to said first output of said planar waveguide optical coupler;
>
> a polarizing beam splitter attached to said polarization rotator for splitting a beam based on its state of polarization, said polarizing beam splitter being optically connected to said first output of said planar waveguide optical coupler to receive said first beam, said polarizing beam splitter outputting two polarized portions of said first beam; and
>
> first and second optical detectors that are optically connected to detect a different one of said two polarized portions of said first beam, said first and second optical detectors generating electrical signals in response to respective ones of said two polarized portions of said first beam;
>
> wherein said polarization rotator is located between said planar waveguide optical coupler and said polarizing beam splitter." (emphasis added)

Applicants assert that the combination of Wetherell and Tsunetsugu does not teach or suggest "a polarization rotator attached to said first output of said planar waveguide optical coupler" and "a polarizing beam splitter attached to said polarization rotator" "wherein said polarization rotator is located between said planar waveguide optical coupler and said polarizing beam splitter" as recited in claim 1. With reference to Wetherell, Fig. 8 does not depict optical elements attached to each other. Specifically, in Fig. 8 of Wetherell the optical coupler (PBS_1) is not attached to the polarization rotators (R_{2x} and R_{2y}) and the polarization rotators (R_{2x} and R_{2y}) are not attached to the polarizing beam splitters (PBS_{2x} and PBS_{2y}). Additionally, Applicants have found no teaching or suggestion in Wetherell that the optical coupler (PBS_1) should be attached to the polarization rotators (R_{2x} and R_{2y}) or that the polarization rotators (R_{2x} and R_{2y}) should be attached to the polarizing beam splitters (PBS_{2x} and PBS_{2y}).

Tsunetsugu teaches a planar waveguide optical coupler and two planar waveguide polarizing beam splitters (PBSs) that are integrated into a single planar lightwave circuit (PLC). The Office action cites Tsunetsugu for teaching that a "planar PBS can be integrated with other optical components to reduce overall system size and increase system reliability." The Office action concludes that it would have been obvious "to use planar PBS and attach rotator to planar waveguide coupler, as taught by Tsunetsugu et al. in the optical detection system of Wetherell because using planar PBS reduces overall system size and increases system reliability."

Applicants assert that claim 1 is not rendered obvious from Wetherell in view of Tsunetsugu because Tsunetsugu teaches away from the claimed invention. In particular, Applicants assert that Tsunetsugu teaches away from attaching a polarization rotator between a planar waveguide optical coupler and a polarizing beam splitter as recited in claim 1 because:

1) the planar waveguide optical coupler and the two planar waveguide PBSs of Tsunetsugu are guided optical elements that cannot both be attached to a polarization rotator without some collimating optics; and

2) Tsunetsugu teaches that polarization control is achieved through "thermo-optic phase shifters".

The planar waveguide optical coupler and the two planar waveguide PBSs of Tsunetsugu are guided optical elements that cannot both be attached to a polarization rotator without some collimating optics

Tsunetsugu teaches that the planar waveguide optical coupler and the two planar waveguide PBSs are integrated onto a single planar waveguide circuit. Both the planar waveguide optical coupler and the two planar waveguide PBSs are waveguide or "guided" optical elements. Guided optical elements utilize differences in refractive indexes within a substrate to form a waveguide within the substrate that optically confines light to a specific path. As is well-known in the field of planar waveguides, light that is to be carried in a planar waveguide must be tightly collimated and precisely aligned to get the light to enter the waveguide portion of the planar waveguide. Therefore, the optical system of claim 1 cannot be formed by simply cutting the planar lightwave circuit taught by Tsunetsugu into two pieces and then attaching a polarization rotator to both of the two pieces. If the planar lightwave circuit of Tsunetsugu was cut into two pieces and a polarization rotator was attached in between, the system would require some collimating optics to ensure that the light exiting the polarization rotator is efficiently coupled into the waveguides of the corresponding planar waveguide PBSs. Collimating optics such as collimating lenses are relatively bulky optical elements that when added to the optical system of Tsunetsugu would increase the size of the optical system and may introduce some coupling loss. Because the addition of the collimating optics would increase the size of the optical system of Tsunetsugu and may introduce some coupling loss, the addition of the collimating optics teaches away from using a single planar waveguide circuit as taught by Tsunetsugu and from the motivations cited in the Office action of "achieving perfect coupling efficiency and reducing module size" (Office action page 2, item 2). It is well settled that it is improper to combine references where the references teach away from their combination. In re Grasselli, 713 F.2d 731, 743, 218 USPQ 769, 779 (Fed. Cir. 1983) [MPEP 2145]

Additionally, if collimating optics were used in the system of Tsunetsugu to ensure that light exiting the polarization rotator is coupled into the waveguides of the corresponding planar waveguide PBSs, the polarization rotator would not be "attached to" the planar waveguide PBSs as is the case in the claimed invention.

<u>Tsunetsugu teaches that polarization control is achieved through "thermo-optic phase shifters"</u>

Claim 1 recites a system in which the polarization rotator is attached between the planar waveguide optical coupler and the polarizing beam splitter. Tsunetsugu teaches a planar lightwave circuit that integrates a planar waveguide optical coupler and two planar waveguide PBSs onto a single silica-based planar lightwave circuit. Tsunetsugu recites at page 570, Section III.A that "[t]he output optical polarization states are controlled by the thermo-optic phase shifters". Applicants have found no other reference to the "thermo-optic phase shifters" in the text or the figures of Tsunetsugu and without any other reference to the "thermo-optic phase shifters" it is difficult to evaluate what the "thermo-optic phase shifters" are and where they are located relative to the planar waveguide optical coupler and the two planar waveguide PBSs. However, it appears from Figs. 1 and 2 of Tsunetsugu that Tsunetsugu teaches controlling polarization without attaching a polarization rotator between the planar waveguide optical coupler and the two planar waveguide PBSs. That is, Tsunetsugu teaches using "thermo-optic phase shifters" to control polarization instead of a polarization rotator attached between a planar waveguide optical coupler and a polarizing beam splitter. Applicants assert that the use of the "thermo-optic phase shifters" by Tsunetsugu teaches away from attaching a polarization rotator between a planar waveguide optical coupler and a polarizing beam splitter as recited in claim 1. Again, it is improper to combine references where the references teach away from their combination.

In conclusion, Applicants assert that because Tsunetsugu teaches away from the combination of Wetherell and Tsunetsugu, claim 1 is not rendered obvious from Wetherell in view of Tsunetsugu.

<u>Claims 4 – 6</u>

Claims 4 – 6 are dependent on claim 1. Applicants assert that claims 4 – 6 are allowable based on an allowable claim 1.

<u>Independent Claim 8</u>

Independent claim 8 recites a system for optical spectrum analysis that is similar to the system of independent claim 1. Because of the similarities between claims 1 and 8, the remarks made above with reference to claim 1 should be applied

also to claim 8. In view of the above remarks, Applicants assert that claim 8 is not rendered obvious from the prior art references.

Claims 12 – 17 and 20

Claims 12 – 17, 19, and 20 are dependent on claim 8. Applicants assert that claims 12 – 17, 19, and 20 are allowable based on an allowable claim 8.

Applicants respectfully request reconsideration of the claims in view of the remarks made herein.

Respectfully submitted,

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Date: August 17, 2005

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